Structural Improvement for Canned Motor-Pump

1. **Field of the Invention**:

The invention relates to a structural improvement for canned motor-pump, particularly to a canned motor-pump, upper edge or bottom edge of the inner shell of which is arranged bending structure, washers in which are arranged.

2. **Background of the Invention**:

Canned motor is usually provided for being arranged above pump, particularly, the sinking pump applied in the transportation of clean water, hot water and dirty water. Since the application of sinking pump is to sink the pump into liquid and contact therewith, so the shell of motor is designed as sealing can, such that the liquid is separated from the coil to prevent liquid from penetrating into coil. The traditional way to separate coil from liquid for a canned motor is to adopt a barrel sealing can, made of metal sheet, placed inside the stator of motor. Several prior structures are exemplified as follows.

As shown in Fig. 1, which is a "Diving Motor with Automatic Lubrication" (U.S. Pat. No. 5,898,245), wherein a motor 10 is to weld a barrel sealing can 18a and two flanges 13, 14 at two sides of outer shell 12 of the stator 18 of the motor into one body; an axis 11 is supported between two upper and lower bearings 15, 16, which are secured by flanges 17, 19 located at two sides of the stator 18. Since this prior structure has the advantages of excellent rigidity and waterproof, so it is mostly applied in deep-well pump-motor or canned motor used in industrial process. However, its biggest drawback is that the whole set of motor must change when its barrel sealing can 18a welded on the outer shell 12 is out of order, and it is impossible to change or dismantle the sealing can; furthermore, after the motor is running, the sealing can 18a will be inflated and deformed because of the heat generated by eddy current, such that a wearing-out or crack will be occurred because of the inter-friction between the rotor 111

and the sealing can 18a; even, the rotor 111 is stuck to make the coil 112 burned.

Please again refer to Fig. 2, which is a "Centrifugal Pump Driven by Diving Motor" (U.S. Patent No. 6,140,725). The prior structure discloses a motor 1, of which rotor 5 is arranged in a sealing can 4, which is welded to upper and lower sides of a shell 2, and bearings 7, 8 are arranged in the sealing can 4. This structure has the same drawback as that of Fig. 1: the whole set of motor must change when the barrel sealing can 4 welded above the shell 2 according to this prior art is broken down, and it is impossible to change or dismantle the sealing can 4; in the meantime, since the function of the sealing can 4 is to support the bearings 7, 8, so the material and strength of the sealing can 4 must be enforced, such that the cost of material or process is raised; furthermore, after the motor is running, the sealing can 4 will be inflated and deformed because of the heat generated by eddy current, such that a wearing-out or break will be occurred because of the inter-friction between the rotor 5 and the sealing can 4; even, the rotor 5 is stuck to make the coil 3 burned.

Please further refer to Fig. 3, which shows an "Electric Motor" (U.S. Pat. No. 6,091,174). The motor 20 discloses an interchangeable structure of sealing can: the rotor 23 is arranged in the shell 24, and the coil 21 and stator 22 are arranged outside the shell 24, and the shell 24 is placed in the outer shell 25 and, cooperating with another shell 26, rubber washers 27 may be arranged among shells 24, 26 and outer shell 25, such that a sealing canned structure is constructed. The advantage of this prior art is the detachability of its shells 24, 26, and the rubber washer 27 may provide appropriate elasticity to make shells 24, 26 have enough space for hot expansion and cold constriction, such that it is possible to improve the drawback of deformation caused by the heat of eddy current in the prior sealing can sealed by welding method. However, the sealing ability of the arrangement of only one rubber washer 27 is still not good enough because, if the dimensional cooperation between the shells 24, 26 and outer shell 25 is inappropriate or the rubber washers 27 lose elasticity or generate cracks because of the long press and the contact with liquid, then the liquid will penetrate into the coil 21; moreover, since the function of the sealing can 24 is to support the bearing 28, so the material and strength of the sealing can

24 must be enforced, such that the cost of material or process is raised.

To enhance the sealing ability of aforementioned interchangeable canned motor, other leakage-resistant washers may be additionally arranged at appropriate positions of the shells. However, they still can not solve the problem substantially, and it is also impossible to overcome the material problem of rubber washer, especially it is impossible to reach the requirement of high leakage-resistance of a deep-water sinking pump.

Summary of the Invention

According to the drawbacks of prior arts, the main objective of the present invention is to provide a structural improvement for canned motor-pump, and the bending structure and washers are applied to form a multi-sealing effect to further improve its sealing effect.

The secondary objective of the present invention is to provide a structural improvement for canned motor-pump, which is simply structured and easily processed, such that it is possible to reduce cost.

Another objective of the present invention is to provide a structural improvement for canned motor-pump, of which inner shell has detachability for facilitating maintenance.

Further another objective of the present invention is to provide a structural improvement for canned motor-pump, of which bearing seat is arranged on an outer shell with thicker wall, such that the damage of inner shell structure may be avoided and the fixation is ensured.

Brief Description of the Drawings

Fig. 1 is a structural cross-sectional view of a canned motor according to prior arts.

Fig. 2 is a structural cross-sectional view of a canned motor according to another prior arts.

Fig. 3 is a structural cross-sectional view of a canned motor according to further another prior arts.

Fig. 4 is a structural cross-sectional view of present invention.

Fig. 5A is a partial enlarging view of part A of Fig. 4.

Fig. 5B is a cross-sectional view of the liquid routes of the invention.

Fig. 6 and Fig. 7 are another two preferable embodiments according to the invention.

Detailed Description of the Invention

For your esteemed member of reviewing committee to further recognize and understand the characteristics, objectives, and functions of the present invention, a detailed description together with corresponding drawings are presented thereinafter.

First, please refer to Fig. 4, which is a structural improvement for canned motor-pump according to the invention, which mainly includes an outer shell 30 made of metal material and an inner shell 40, which is arranged in the outer shell 30, and in which an axis 50 and a motor rotor 51 are arranged. A stator 52 and coils 53 are arranged between the outer shell 40 and the inner shell 30. The outer shell 30 has a thicker wall for providing a stronger structure to the motor. The inner shell 40 is made of metal sheet. Two bearings 54, 55 are arranged at two sides of the axis 50. The bearing 54 arranged above may be a plane bearing. The bearing 55 arranged below may be a plane bearing or a push-resistant bearing. Both bearings 54, 55 are arranged in two bearing seats 56, 57 respectively. The bearing seat 56 arranged above is projected appropriately out the outer shell 30. The projection section 561 is fastened by a fastening ring 562 to position the bearing seat 56 at the upper portion of the outer shell 30. The bearing seat 57 arranged below is arranged axially at the bottom in the inner shell 40. The bottom of the inner shell 40 is welded on a seat 58, which provides the needed position function and structure strength to the bearing seat 57, inner shell 40 and outer shell 30 simultaneously. Bolts 61 are applied to bolt the outer shell 30 to the pump shell 60. A sealing washer

581 is applied to insulate the liquid from penetrating into the coil 53 or stator 52. An axis 50 is extended into the pump shell 60 and is arranged axially to the impeller 62. Consequently, a canned motor-pump structure is constructed.

In the meantime, please refer to Fig. 4, Fig. 5A and Fig. 5B. Another characteristic of the invention is to provide the inner shell 40 with a bending structure 70 that is formed integrally by stamping method. In this embodiment, the bending structure 70 is arranged at the upper edge of the inner shell 40, wherein at least two grooves 71, 72 surrounding the inner shell 30. The opening directions of adjacent grooves 71, 72 are different. The groove 71 located inside the inner shell 40 is recessed from the outer surface of the inner shell 40 into the inner shell 40; that is, the opening of the groove 71 is faced outwardly. The adjacent groove 72 is recessed from the inner surface of the inner shell 40 to the outside of the inner shell 40; that is, the opening of the grove is faced inwardly. Two washers 73a, 73b are arranged in the two grooves 71, 72. To accommodate the grooves 71, 72 and the washers 73a, 73b, recessions may be arranged at the places corresponding to the bearing seat 56 or outer shell 30. As shown in the drawings, a recession 563 is arranged in the bearing seat 56 to accommodate the bending structure 70 and the washers 73a, 73b. After the inner shell 40 and the bearing 56 are pushed upwardly into the outer shell 30, the bending structure 70, the washers 73a, 73b and inner shell 40 are tightly arranged between the bearing seat 56 and the outer shell 30. The outer wall 711 of the groove 71 inside the inner shell 40 is abutted with the bearing seat 56. The washer 73a arranged in the groove 71 is abutted between the inner wall 712 of the groove 71 and the outer shell 30. The outer wall 721 of the groove 72 located outside the inner shell 30 is abutted with the outer shell 30. The washer 73b in the groove 72 arranged outside is in the meanwhile abutted among the inner wall 722 of the outside groove 72, the bearing seat 56 and outer shell 30. By the compact inter-abutments among bearing seat 56, the grooves 71, 72, the washers 73a, 73b and outer shell 30, a multi-sealing effect is constructed, such that the penetration of liquid into the route may be blocked out indeed. As shown in Fig. 5B, the arrows illustrate the penetration routes of liquid (in the drawings, the distances between each element are enlarged intentionally, such that the routes may be shown clearly). First, the liquid penetrates into the adjacency of the

bearing seat 56 and the inner shell 40 or into the adjacency of bearing seat 56 and outer shell 30. Then, the penetrating fluid flows through the grooves 71, 72, the washers 73a, 73b and the outer shell 30. Through the adjacency of the inner shell 40 and the outer shell 30, the fluid penetrates into the coil (not shown in the drawings, please refer to Fig. 4) arranged between the inner shell 40 and the outer shell 30. When the bearing seat 56, the grooves 71, 72, the washers 73a, 73b and outer shell 30 are tightly abutted together and there is no gap left (as shown in Fig. 5A), the multiple blocking structure constructed by the bending structure 70 and the washers 73a, 73b according to the invention may indeed reach a superior effect to stop the liquid from invading into the coil if comparing to the prior art shown in Fig. 3, where only one washer 27 is arranged.

Another point needed to emphasize is that the inner shell 40, bearing seat 56 and outer shell 30 are all made of metal materials. The inner shell 40 is commonly made of metal sheet, of which thickness is approximately 0.2~0.3 mm. When the washers 73a, 73b press the grooves 71, 72 for inter-abutting with the bearing seat 56 and the outer shell 30, the interactions between metals will make the grooves 71, 72, the bearing seat 56 and the outer shell 30 pressed together naturally, such that a sealing effect may be reached.

Again, please refer to Fig. 6. A bending structure 70, same as that of Fig. 4, is arranged at the upper edge of the inner shell 40. The bending structure 70 includes two grooves, of which openings are faced to two different directions. There are two washers 73a, 73b arranged in the grooves 71, 72. A bending structure 170 is further arranged at the bottom edge of the inner shell 40. The structure of the bending structure 170 and the aforementioned bending structure 70 located at the upper edge of the inner shell 40 are related as mirror-reflecting state with respect to the inner shell 40. The groove 171 located inside the inner shell 40 is recessed from the inner surface of the inner shell 40 to the outside of the inner shell 40. The adjacent groove 172 is recessed from the outside surface of the inner shell 40 to the inside of the inner shell 40. There are washers 173a, 173b arranged in the grooves 171, 172. A flange 158 is arranged between the outer shell 30 and the lower bearing seat 57. A recession 1581, arranged between the flange 158 and the lower bearing seat 57, may accommodate

the bending structure 170 at the bottom edge of the inner shell and the washers 173a, 173b. Applying the outer shell 30 and the upper bearing seat 56, the bending structure 70 located at the upper portion of the inner shell 40 and the washers 73a, 73b are tightly arranged in the recession 563. Applying the flange 158 and the lower bearing seat 57, the bending structure located at the lower portion of the inner shell 40 and the washers 173a, 173b are tightly arranged in the recession 1581. Consequently, multiple sealing effects are provided at the upper portion and the lower portion of the inner shell 40.

Again, please refer to Fig. 7. This embodiment is similar to Fig. 6. The difference is that the diameter of the bottom edge of the inner shell 140 is approximately larger than the outer diameter of the inner shell 140, such that the lower half section of the inner shell 140 has an inclining cone surface 141 that is narrow in upper side and wide in lower side. There is a wrinkling structure 142 shaped as waves on the inclining cone surface 141 in the axial direction. By such design of the inclining cone surface 141, it will facilitate the inner shell 140 in inserting into the outer shell 30. And, by this wrinkling structure 142, the heat generated from the eddy current during the running of the motor may be absorbed. Consequently, an appropriate tolerance of deformation may be provided to the inner shell 140.

In sum, the invention has following advantages:

1. The bending structure and the plural washers may form multiple sealing effects, such that a superior function may be reached;

2. Its structure is simple and easy to process, such that the cost may be reduced;

3. The inner shell has detachability, such that its maintenance is easy;

4. Its bearing seat is arranged on the outer shell with thicker wall, such that the damage of the structure of the inner shell may be avoided and its stability is secured.

However, above description is only the preferable embodiment of the present invention and can not be regarded as a restriction for its scope. That is, any variation and modification made according to the claimed field of the invention still possess its merits and are also within its spirit and field,

so they are all regarded as further executing situations for the present invention.